

**WHAT IS CLAIMED IS:**

1        1. An exhaust manifold cooling jacket comprising a housing to be attached to a  
2 cylinder head of a combustion engine, the housing defining  
3              a cavity sized to enclose an exhaust manifold of the engine and form an insulating  
4 space between the exhaust manifold and housing, as attached to the cylinder head,  
5              a coolant passage therein for receiving liquid coolant from an inlet of the jacket and  
6 for flowing the coolant through the cooling jacket, and  
7              an exhaust passage extending between an inner manifold interface surface of the  
8 housing and an exhaust elbow interface surface of the housing, for forming a sealed exhaust  
9 conduit for conducting a flow of exhaust from the exhaust manifold through the housing.

1        2. The exhaust manifold cooling jacket of claim 1, wherein the cooling jacket  
2 housing is in the form of a shell having an open side sufficiently large to permit the housing  
3 to be placed about the exhaust manifold of the engine with the exhaust manifold mounted  
4 upon the cylinder head.

1        3. The exhaust manifold cooling jacket of claim 2, wherein the open side of the  
2 housing comprises a rim extending about the open side and lying in a single plane to form a  
3 planar block interface surface.

1        4. The exhaust manifold cooling jacket of claim 3, wherein the rim of the  
2 housing is arranged to be coplanar with a block interface surface of the exhaust manifold, as  
3 attached to the cylinder head, for engaging a backing plate mounted between the cylinder  
4 head and exhaust manifold and extending laterally beyond the exhaust manifold.

1        5. The exhaust manifold cooling jacket of claim 1, wherein the cooling jacket  
2 housing is sized and constructed to directly contact the exhaust manifold only at the inner  
3 manifold interface surface.

1        6. The exhaust manifold cooling jacket of claim 1, wherein the coolant passage  
2 comprises a single enclosed, cup-shaped cavity extending across one broad face of the  
3 housing and into multiple sides of the housing.

1       7. The exhaust manifold cooling jacket of claim 1, wherein the housing further  
2 defines a coolant outlet extending from the coolant passage through the exhaust elbow  
3 interface surface adjacent the exhaust conduit.

1       8. The exhaust manifold cooling jacket of claim 1, wherein the housing is in the  
2 form of a unitary casting.

1       9. The exhaust manifold cooling jacket of claim 1, wherein the housing further  
2 defines at least one mounting hole extending through the housing adjacent the exhaust  
3 passage and arranged to align with a mounting hole on the exhaust manifold, for receiving a  
4 threaded fastener to attach the housing to the cylinder head via the exhaust manifold.

1       10. The exhaust manifold cooling jacket of claim 9, wherein the mounting hole of  
2 the housing is further arranged to align with a corresponding mounting hole on an exhaust  
3 elbow placed against the exhaust elbow interface surface to receive exhaust flow from the  
4 exhaust conduit, for simultaneously attaching both the housing and the exhaust elbow to the  
5 exhaust manifold.

1       11. The exhaust manifold cooling jacket of claim 1, wherein the cooling jacket is  
2 constructed to isolate the liquid coolant from any direct contact with the exhaust manifold.

1       12. The exhaust manifold cooling jacket of claim 1, wherein said insulating space  
2 is filled with air and isolated from the flow of exhaust.

1       13. The exhaust manifold cooling jacket of claim 1, wherein said insulating space  
2 is filled with a conductively insulating material.

1       14. A method of altering a combustion engine to enhance exhaust gas cooling for  
2 use in a marine environment, the method comprising the step of placing a cooling jacket  
3 directly between an upstream exhaust manifold secured to a cylinder head of the engine, and  
4 a downstream exhaust elbow of the engine, the cooling jacket comprising a housing defining  
5 a cavity sized to enclose an exhaust manifold of the engine and form an insulating  
6 space between the exhaust manifold and housing, as attached to the cylinder head,

7           a coolant passage therein for receiving liquid coolant from an inlet of the jacket and  
8       for flowing the coolant through the cooling jacket, and  
9           an exhaust passage extending between an inner manifold interface surface of the  
10      housing and an exhaust elbow interface surface of the housing, for forming a sealed exhaust  
11      conduit from the exhaust manifold through the housing.

1           15.     The method of claim 14 further comprising the step of placing a backing plate  
2       between the exhaust manifold and the cylinder head, the backing plate defining sealed  
3       passages therethrough for conducting exhaust gasses from the cylinder head to the exhaust  
4       manifold, the backing plate extending laterally beyond the exhaust manifold to engage the  
5       cooling jacket housing to inhibit air flow through the insulating space between the cooling  
6       jacket housing and the exhaust manifold.

1           16.     The method of claim 14 further comprising the step of providing the exhaust  
2       elbow with a coolant passage with an inlet for receiving the coolant from the cooling jacket  
3       housing and for injecting the coolant into a flow of exhaust received from the exhaust  
4       manifold through the cooling jacket housing.

1           17.     The method of claim 14 comprising simultaneously mounting the exhaust  
2       elbow and cooling jacket housing to the exhaust manifold by inserting at least one fastener  
3       through aligned mounting holes in the exhaust elbow and cooling jacket housing and securing  
4       the fastener to the exhaust manifold.

1           18.     An exhaust manifold cooling jacket, comprising  
2           a housing forming a cavity sized to enclose an exhaust manifold of a combustion  
3       engine with a gap therebetween, the housing defining a coolant inlet and a passage  
4       therethrough for the flowing of liquid coolant through the cooling jacket.